

## CHEM-E7190/2023: Exercise Extra - ODE

1. Solve the following higher order homogeneous linear differential equation

$$y''' + y'' - 6y' + 4y = 0$$

2. Solve the following initial value problem

$$y^{(3)} - 5y'' - 22y' + 56y = 0 \quad y(0) = 1 \quad y'(0) = -2 \quad y''(0) = -4$$

3. Solve the following differential equation.

$$2y^{(4)} + 11y^{(3)} + 18y'' + 4y' - 8y = 0$$

4. Solve the following differential equation.

$$y^{(5)} + 12y^{(4)} + 104y^{(3)} + 408y'' + 1156y' = 0$$

5. Solve the following differential equation.

$$y^{(5)} - 15y^{(4)} + 84y^{(3)} - 220y'' + 275y' - 125y = 0$$

6. Convert a fourth order ODE into a system of first order ODEs

$$y^{(4)} - 7y^{(3)} + 4y'' + 5y' - 2y = 0$$

7. Convert a second order initial value problem in to a system of first order ODEs and initial values for them.

$$y'' - 3y' + 2y = \cos 3t, \quad x(0) = 2, \quad x'(0) = -3$$